

WHAT IS CLAIMED IS:

1. An optical waveguide comprising:  
a single mode waveguide;  
a multi-mode waveguide configured to realize multi-mode and connected to said  
5 single mode waveguide, said multi-mode waveguide being a multi-mode broadening  
waveguide having a width which increases toward a direction of light propagation.
2. An optical waveguide according to claim 1, wherein said multi-mode broadening  
waveguide has a trapezoidal shape with first and second bases connected by oblique sides.
3. An optical waveguide according to claim 2, wherein the single mode waveguide  
10 comprises an optical input waveguide with a first width and a straight waveguide with a  
second width less than the first width, said second width of said straight waveguide is further  
less than a width of both said first and second bases.
4. An optical waveguide according to claim 1, wherein said multi-mode waveguide  
includes a constant width waveguide connected to said single mode waveguide and a  
15 trapezoidal shaped waveguide connected to said constant width waveguide as said multi-  
mode broadening waveguide.
5. An optical waveguide according to claim 4, wherein the single mode waveguide  
comprises an optical input waveguide with a first width and a straight waveguide with a  
second width less than the first width, said second width of said straight waveguide is further  
20 less than a width of both said first and second bases.
6. An arrayed waveguide grating optical multiplexer/demultiplexer comprising:  
at least one optical input waveguide;  
a first slab waveguide connected to an output end of said at least one optical input  
waveguide;  
25 an arrayed waveguide connected to an output end of said first slab waveguide and  
being a plurality of channel waveguides arranged side by side, for transmitting light that has  
traveled through said first slab waveguide, said channel waveguides having different

predetermined lengths;

a second slab waveguide connected to an output end of said arrayed waveguide;

at least one optical output waveguide connected to an output end of said second slab waveguide; and

5 at least one multi-mode waveguide connected between at least one of said at least one optical input waveguide and said first slab waveguide or between said second slab waveguide and said at least one optical output waveguide, said at least one multi-mode waveguide including:

10 a multi-mode waveguide configured to realize multi-mode and being a multi-mode broadening waveguide having a width which increases toward a direction of an arrayed waveguide.

7. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 6, wherein said at least one input waveguide includes a plurality of input waveguides arranged side by side and said at least one output waveguide includes a plurality of output waveguides arranged side by side.

8. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 6, wherein said multi-mode broadening waveguide has a trapezoidal shape with first and second bases connected by oblique sides.

9. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 6, wherein the single mode waveguide comprises an optical input waveguide with a first width and a straight waveguide with a second width less than the first width, said second width of said straight waveguide is further less than a width of both said first and second bases.

10. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 6, wherein said multi-mode waveguide includes a constant width waveguide connected to said single mode waveguide and a trapezoidal shaped waveguide connected to said constant width waveguide as said multi-mode broadening waveguide.

11. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 6, wherein the single mode waveguide comprises an optical input waveguide with a first width and a straight waveguide with a second width less than the first width, said second width of said straight waveguide is further less than a width of both said first and second bases.

12. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 7, wherein said multi-mode broadening waveguide has a trapezoidal shape with first and second bases connected by oblique sides.

13. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 7, wherein the single mode waveguide comprises an optical input waveguide with a first width and a straight waveguide with a second width less than the first width, said second width of said straight waveguide is further less than a width of both said first and second bases.

14. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 7, wherein said multi-mode waveguide includes a constant width waveguide connected to said single mode waveguide and a trapezoidal shaped waveguide connected to said constant width waveguide as said multi-mode broadening waveguide.

15. An arrayed waveguide grating optical multiplexer/demultiplexer according to claim 7, wherein said multi-mode waveguide includes a constant width waveguide connected to said single mode waveguide and a trapezoidal shaped waveguide connected to said constant width waveguide as said multi-mode broadening waveguide.

16. An arrayed waveguide grating optical multiplexer/demultiplexer comprising:  
single mode waveguide means for propagating a single mode optical signal;  
multi-mode waveguide means for propagating a multi-mode optical signal connected to said single mode waveguide means, said multi-mode waveguide including multi-mode broadening waveguide means having a width increasing in a direction of an arrayed waveguide.

17. An array waveguide grating optical multiplexer/demultiplexer comprising:  
input optical waveguide means for receiving an optical signal;  
first slab waveguide means connected to an output end of said optical input  
waveguide means;

5       arrayed waveguide means connected to an output end of said first slab waveguide  
mean for transmitting light that has traveled through said first slab waveguide;

second slab waveguide means connected to an output end of said arrayed waveguide  
means;

10       output optical waveguide means connected to an output end of said second slab  
waveguide means; and

15       multi-mode waveguide means at least one multi-mode waveguide connected between  
at least one of said at least one optical input waveguide and said first slab waveguide or  
between said second slab waveguide and said at least one optical output waveguide, said at  
least one multi-mode waveguide for realizing multi-mode and including multi-mode  
broadening waveguide means.

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